

**Prince George's County
Building Lifecycle Utility Cost Analysis**



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Abstract

Prince George's County Parks & Recreation builds, operates, and maintains a number of facilities with significant lifespans. To better understand the impact of capital investment and building code changes that might lead to reducing long term operating costs, the Department seeks a comparative analysis using available utilities usage data from six large, well established facilities.

This project has a business objective—to understand the relationship between initial capital investment, changes in building codes, and long-term operational costs. This will enable Prince George's County Parks & Recreation to make better informed decisions about the construction of new facilities and about minimizing long-term operational costs. To meet the objective, the team developed contextualized data visualizations that tell the story of how initial capital investment affects building operating costs.

Executive Summary

This project collected and analyzed utility data to create visualizations of the operating costs for six facilities: Southern Area Aquatics and Recreation Complex, Southern Regional Technology and Recreation Center, Palmer Park Community Center, Westphalia Community Center, Laurel-Beltsville Senior Center, and Publick Playhouse.

Due to data quality issues and time constraints, the project scope changed. Westphalia was dropped, altering the project deliverables as follows:

- A high-level overview of the long-term utility usage for five facilities.
- Visualizations using Tableau that tell the story of utility usage and costs for the five facilities.
- Python coded notebook with data cleaning and processing that can be used for future buildings.
- User documentation of the notebook.
- Final report of the findings.

Methods

Data Overview and Cleaning Process

The utilities data was received in a flat Excel file containing data for all locations. The data team inspected the file and found numerous data quality problems that needed to be fixed before analysis. The problems included different names for one building, inconsistent billing periods, repeat billing IDs, billing periods with no utility usage, and billing periods with no cost.

A sequence of steps was followed to clean the data. First, building names were standardized in the dataset. Then, duplicate billing IDs were aggregated. Following this, rows where cost was zero were removed. Finally, the data was split into subsets by location, and ordered chronologically by billing start date. Rows where native use was 0 were removed to create EUI graphs.

The team developed a Jupyter notebook to read, clean, and produce visualizations from the data.

Deliverables

Due to misalignment of data with the physical resources we were unable to validate the quality of the visualizations and output, and we strongly recommend further analysis to better align the data to the physical sites to improve the model's accuracy.

Data Visualization

For the visualizations, we used Tableau to create charts that show trends across facilities and utilities. We used the story display throughout the facilities to consolidate usage and cost across utilities. The data visualization generated for each category are below.

For reference, the National EUI Index by property type:

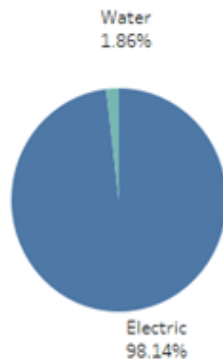
<https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf>

Entertainment/Public Assembly	Convention Center		109.6	56.1	CBECS - Social/Meeting	
	Movie Theater		112.0	56.2	CBECS - Public Assembly	
	Museum					
	Performing Arts					
	Recreation	Bowling Alley		112.0	50.8	CBECS - Recreation
		Fitness Center/Health Club/Gym				
		Ice/Curling Rink				
		Roller Rink				
		Swimming Pool				
		Other - Recreation				
Social/Meeting Hall		109.6	56.1	CBECS - Social/Meeting		

Percentage usage of all utilities across five facilities

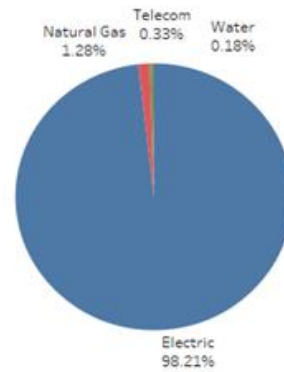
Laurel

Pie Chart of Commodity Usage	Percentage Cost of All Utilities	Average Yearly Electric Usage
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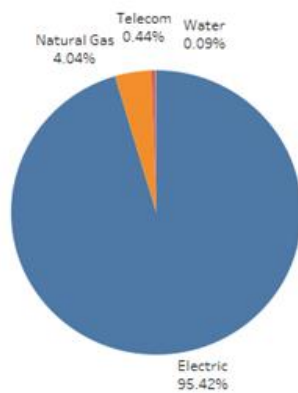
Palmer Park

Percentage Cost of All Utilities	Percentage of Total Native Usage by Commodity	Average Yearly Gas Usage
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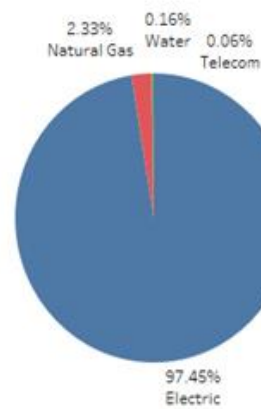
Publick Playhouse

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Electric Cost
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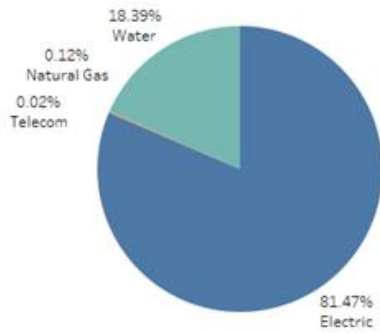
Southern Area Aquatics

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage
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Southern Tech and Rec

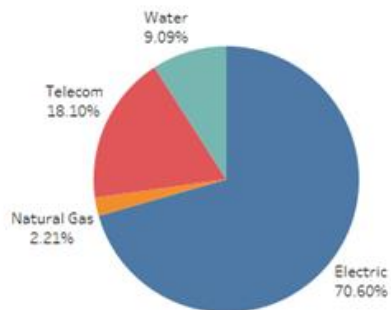
Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage
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Percentage cost of all utilities across five facilities

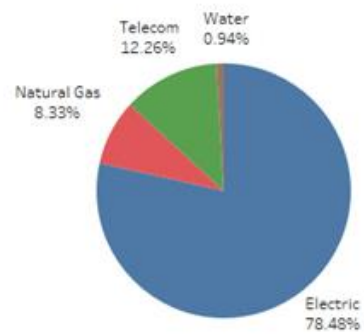
Laurel

Pie Chart of Commodity Usage	Percentage Cost of All Utilities	Average Yearly Electric Usage
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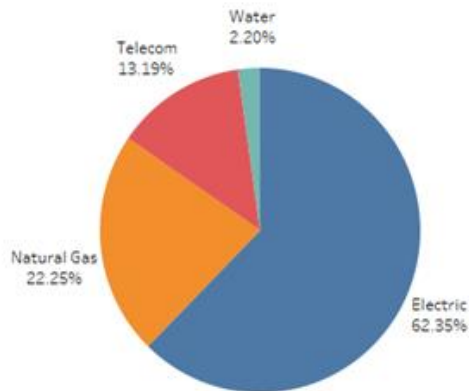
Palmer Park

Percentage Cost of All Utilities	Percentage of Total Native Usage by Commodity	Average Yearly Gas Usage
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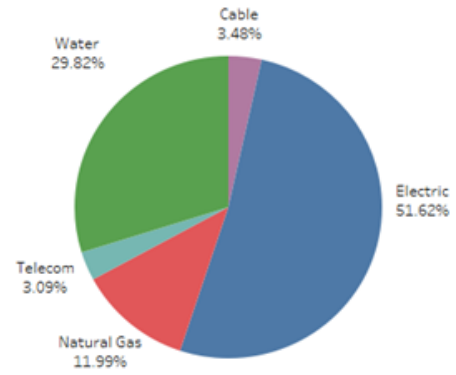
Publick Playhouse

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Electric Cost
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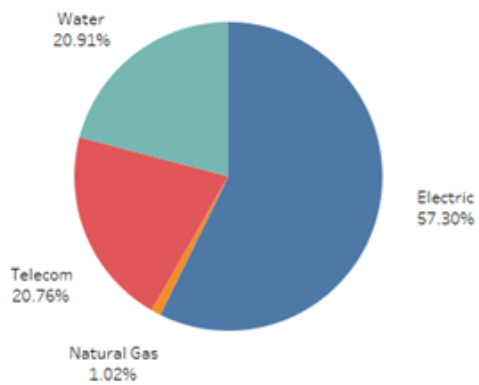
Southern Area Aquatics

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage
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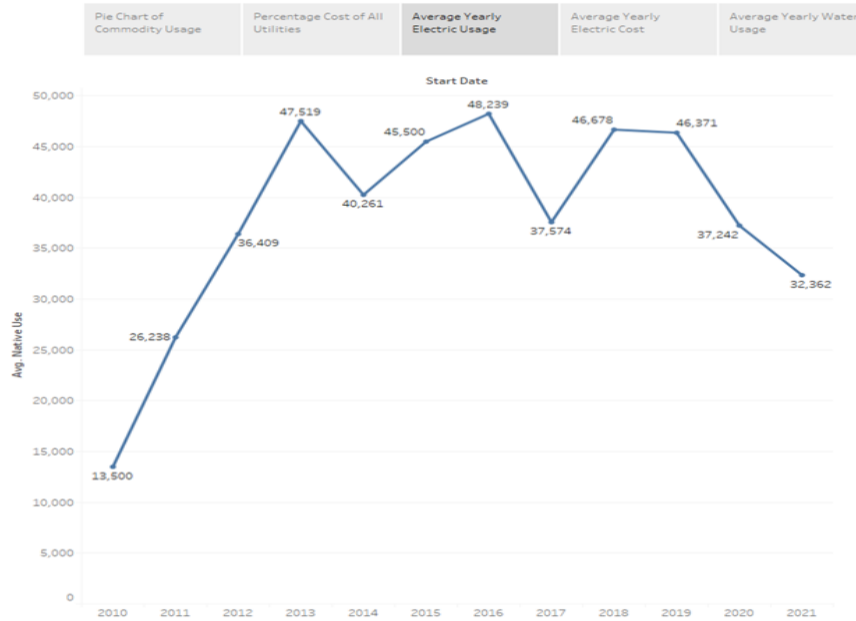
Southern Tech and Rec

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage
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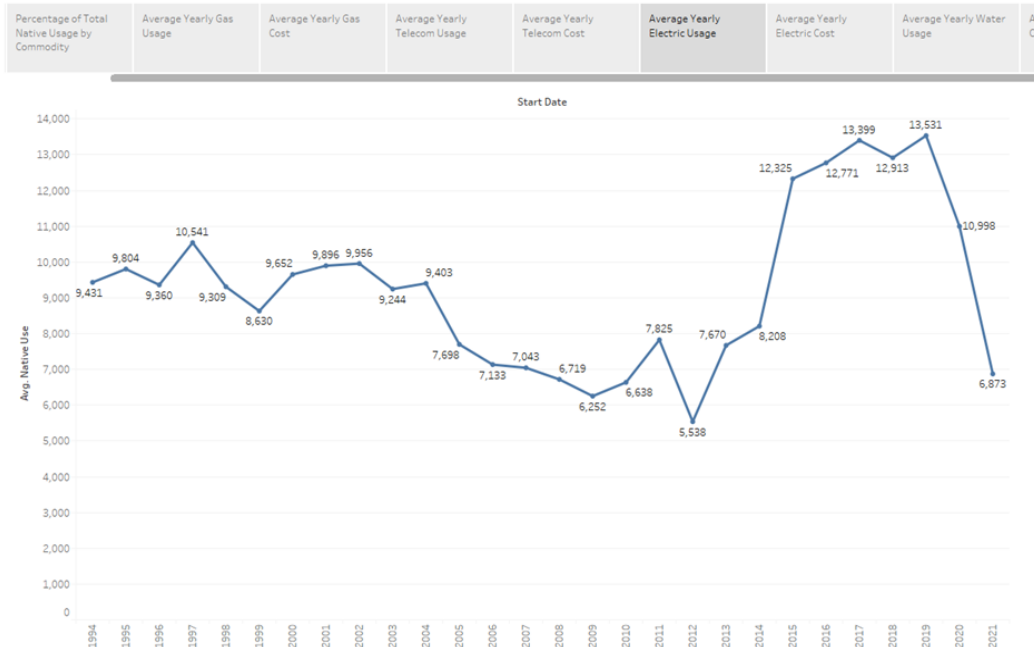


Average yearly electric usage across five facilities

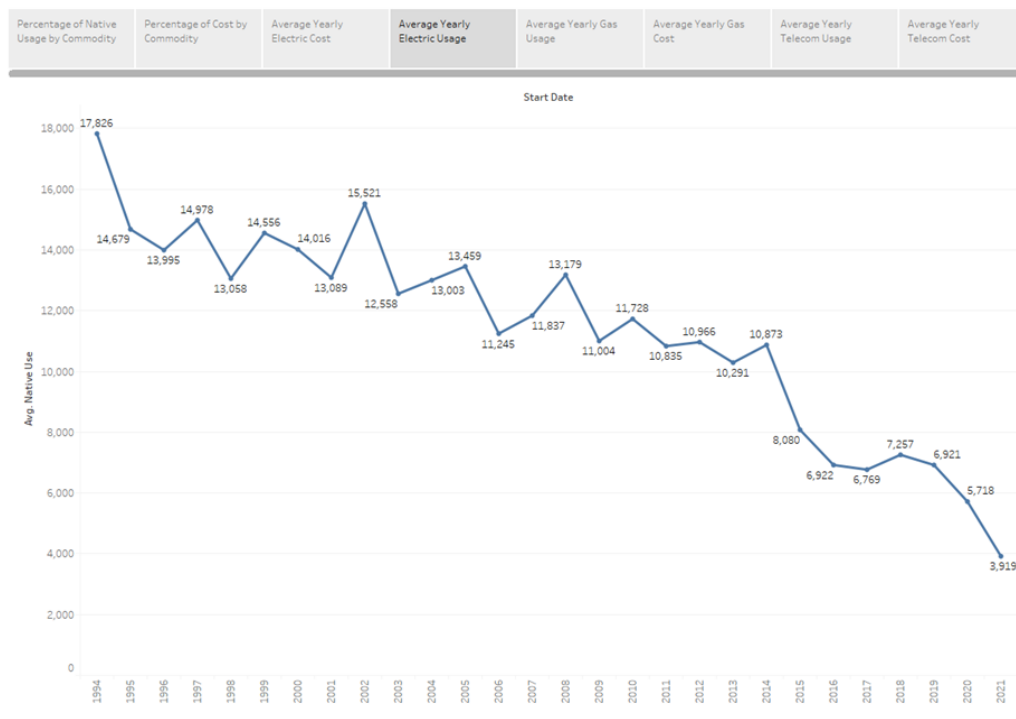
Laurel



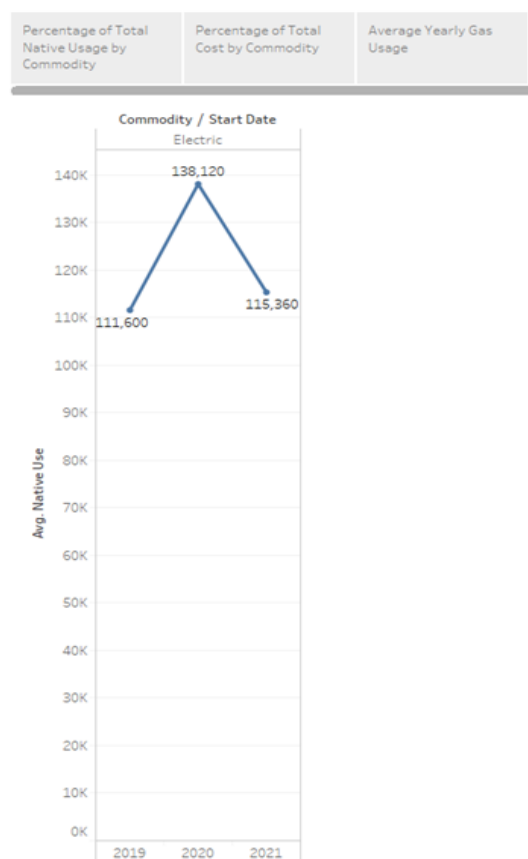
Palmer Park



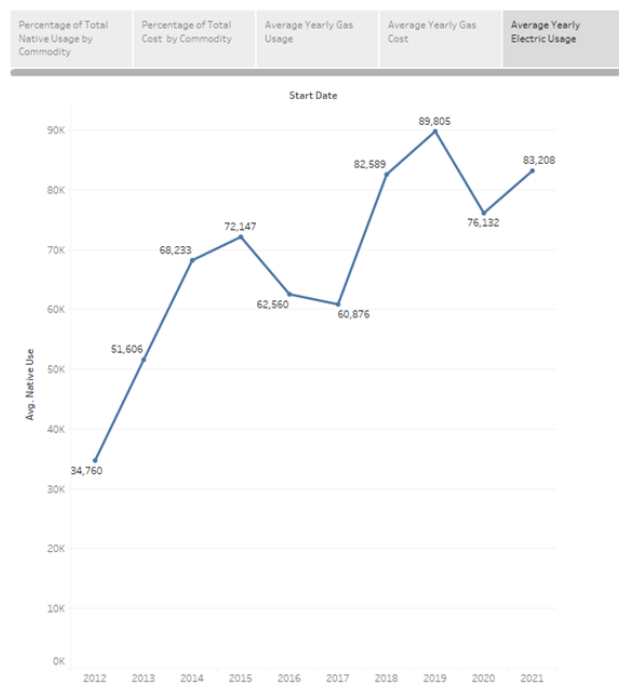
Publick Playhouse



Southern Area Aquatics



Southern Tech and Rec



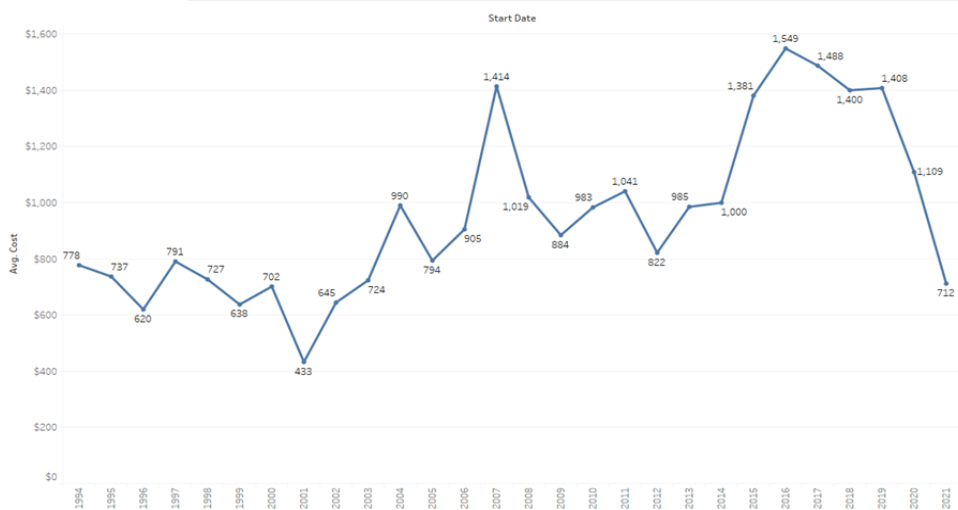
Average yearly energy cost across five facilities

Laurel



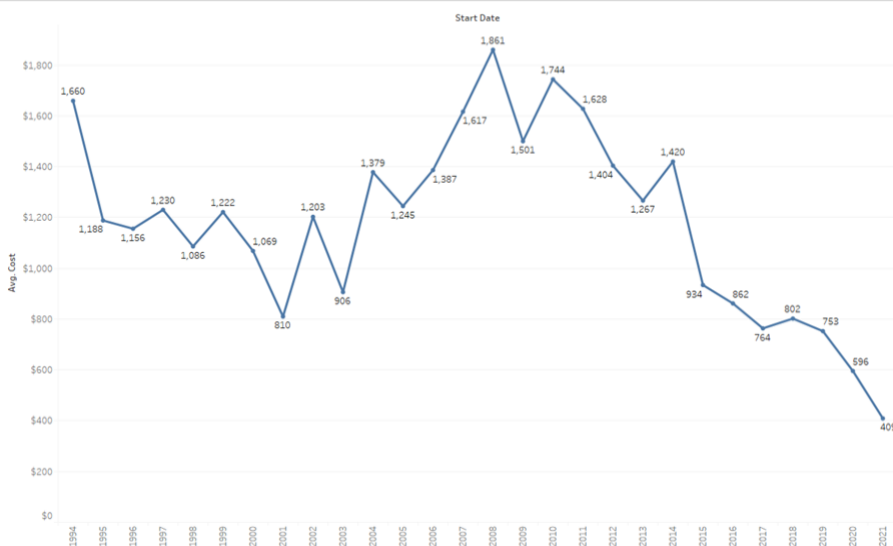
Palmer Park

Percentage of Native Usage by Commodity	Percentage of Cost by Commodity	Average Yearly Electric Cost	Average Yearly Electric Usage	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Water Usage	Average Yearly Water Cost
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Publick Playhouse

Percentage of Native Usage by Commodity	Percentage of Cost by Commodity	Average Yearly Electric Cost	Average Yearly Electric Usage	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost
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Southern Area Aquatics

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Year Usage
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Southern Tech and Rec

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Water Usage	Average Yearly Water Cost	Total Yearly Usage for All Utilities	Total Yearly Cost
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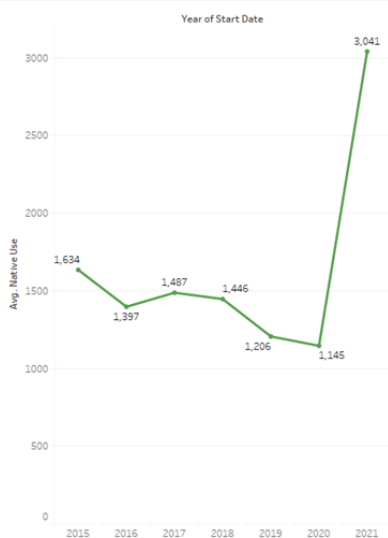


Average yearly gas usage across five facilities

The Laurel dataset has no gas usage.

Palmer Park

Percentage Cost of All Utilities	Percentage of Total Native Usage by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost
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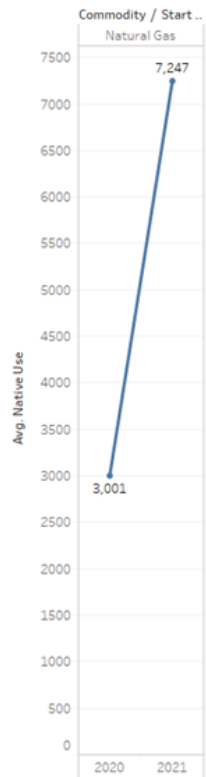
Publick Playhouse

Percentage of Native Usage by Commodity	Percentage of Cost by Commodity	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost
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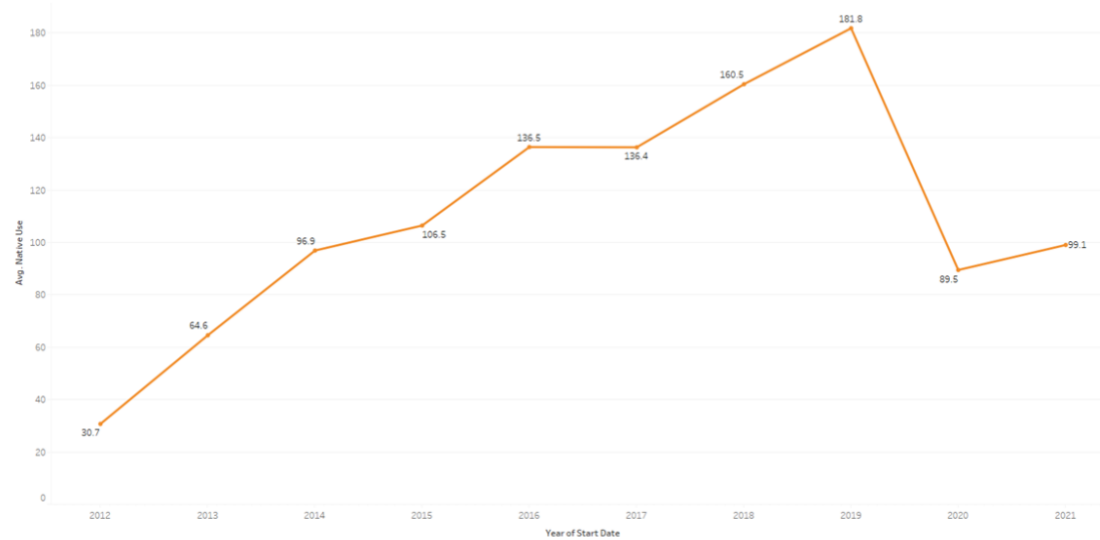
Southern Area Aquatics

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity
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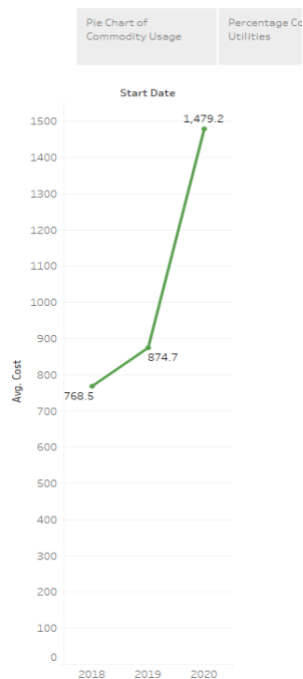
Southern Tech and Rec

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Water Usage	Average Yearly Water Cost
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Average yearly gas cost across all facilities

Laurel



Palmer Park



Publick Playhouse



Southern Area Aquatics

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity
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Southern Tech and Rec

Percentage of Total Native Usage by Commodity	Percentage of Total Cost by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage
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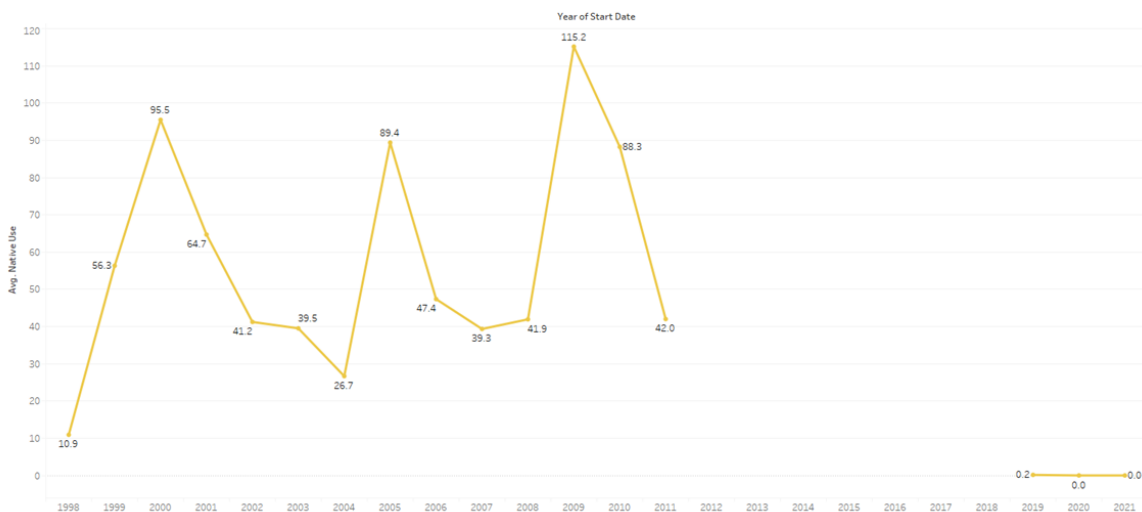


Average yearly telecom usage

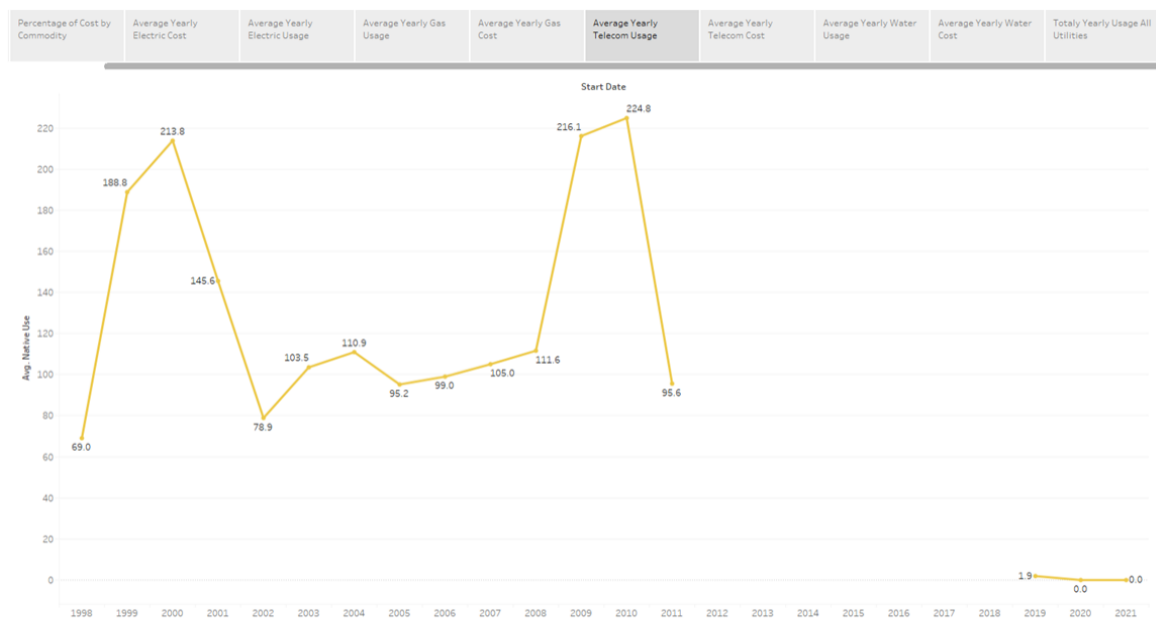
The Laurel dataset has no telecom usage data.

Palmer Park

Percentage Cost of All Utilities	Percentage of Total Native Usage by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost
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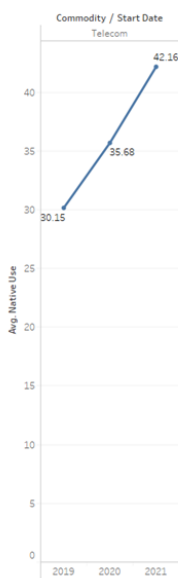


Publick Playhouse



Southern Area Aquatics

A	Average Yearly Gas Cost	Average Yearly Electric Usage
V.		



Southern Tech and Rec

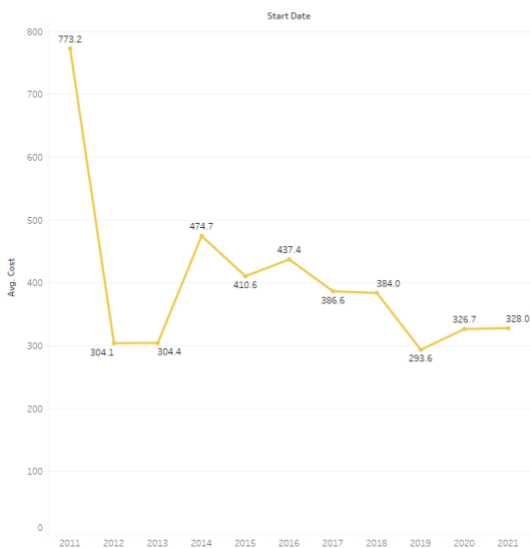
Percentage of Total Cost by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost
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Average yearly telecom cost across facilities

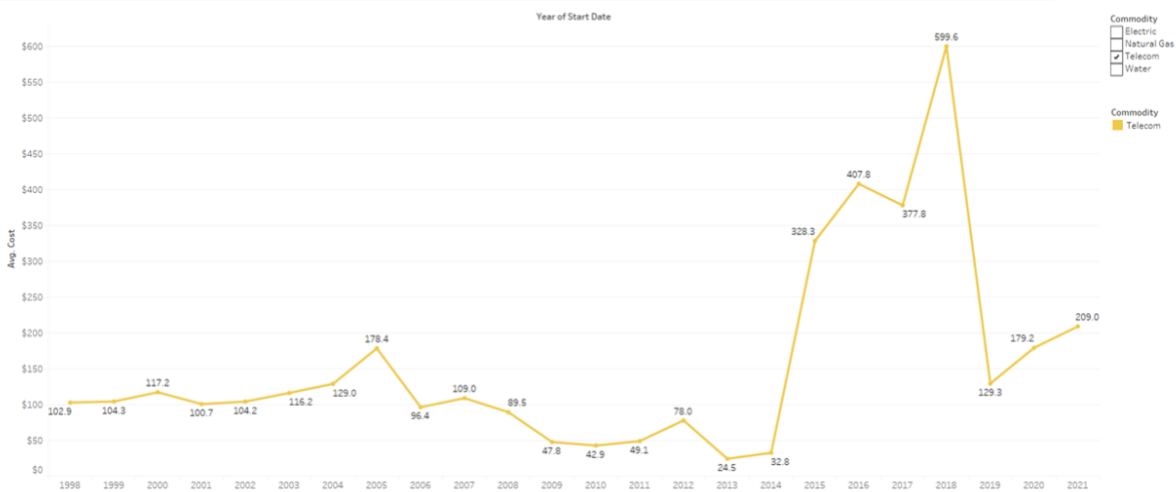
Laurel

Pie Chart of Commodity Usage	Percentage Cost of All Utilities	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	A
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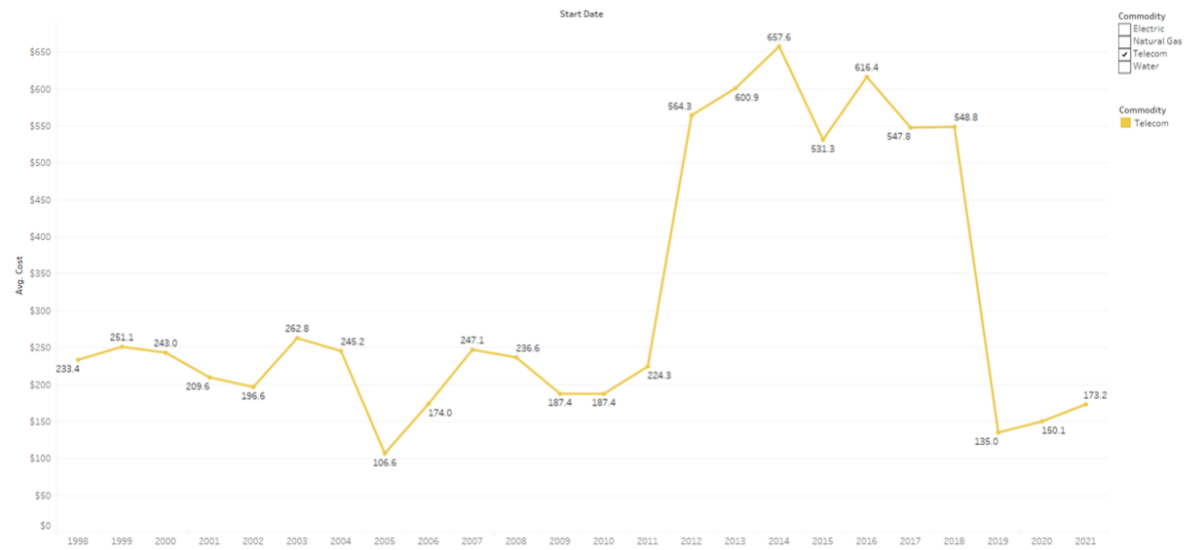
Palmer Park

Percentage Cost of All Utilities	Percentage of Total Native Usage by Commodity	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Total Yearly Usage All Utilities	T
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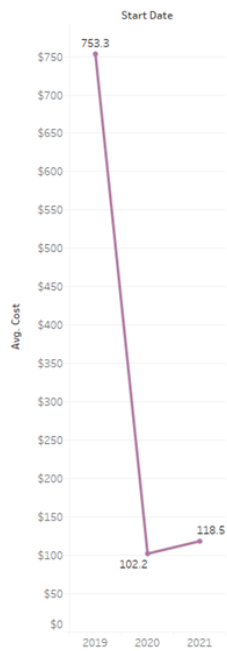
Publick Playhouse

Per	Average Yearly Electric Cost	Average Yearly Electric Usage	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Water Usage	Average Yearly Water Cost	Totally Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
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Southern Area Aquatics

A	Average Yearly Gas Cost	Average Yearly Electric Usage
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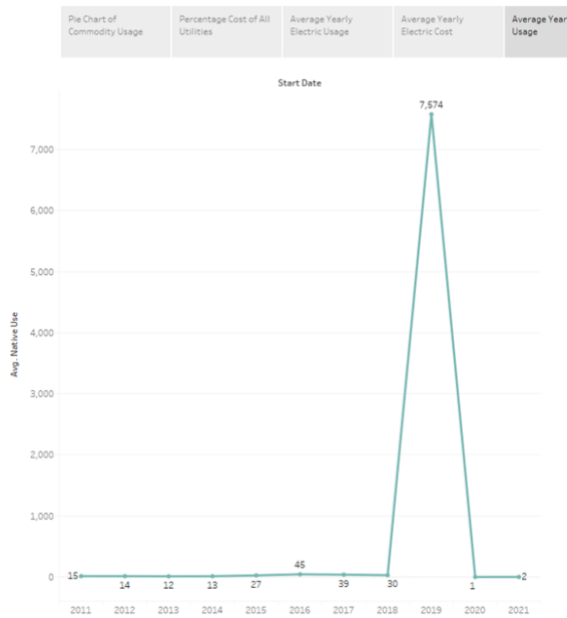
Southern Tech and Rec

P	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Telecom Usage
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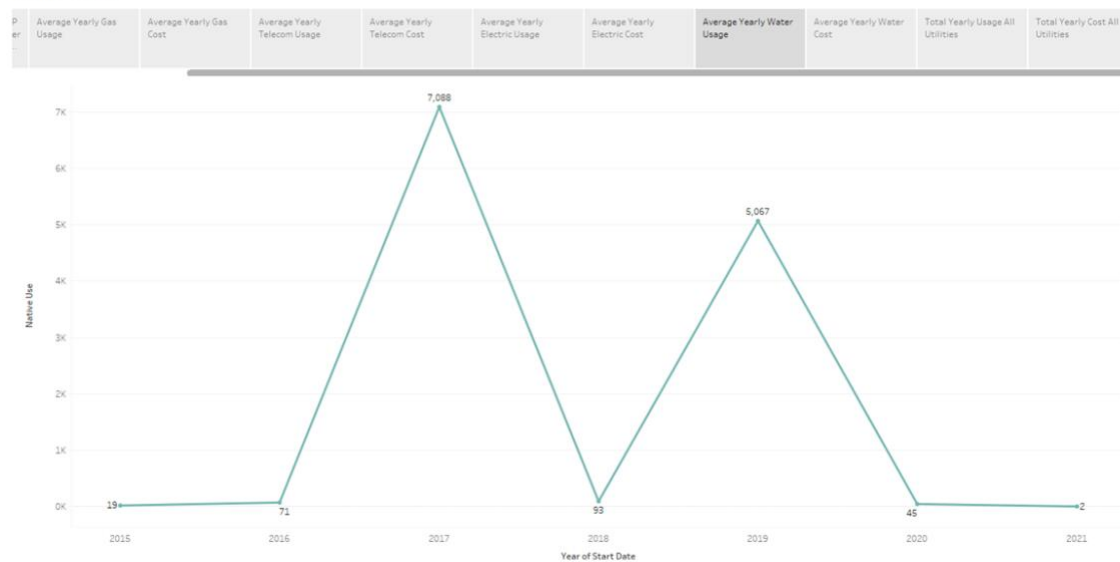


Average yearly water usage across facilities

Laurel

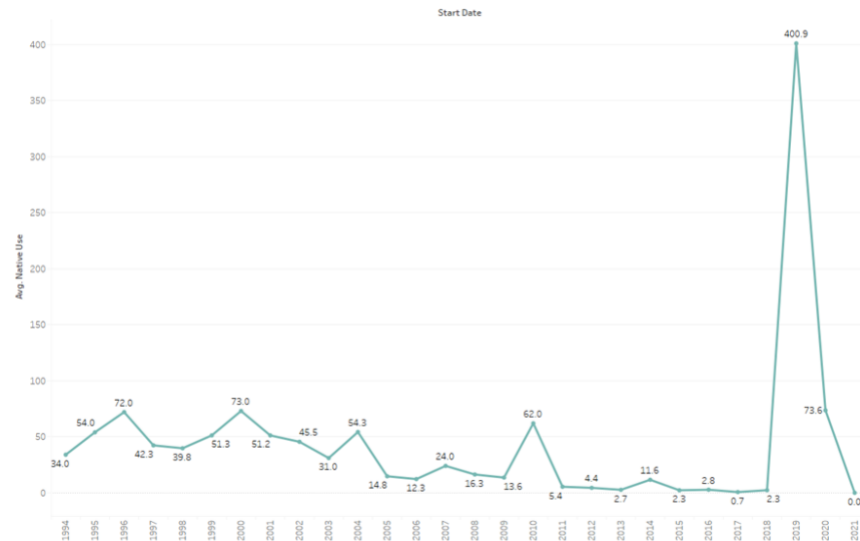


Palmer Park



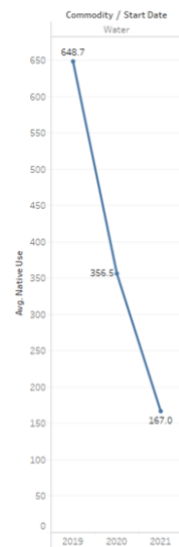
Publick Playhouse

P er -	Average Yearly Electric Cost	Average Yearly Electric Usage	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Water Usage	Average Yearly Water Cost
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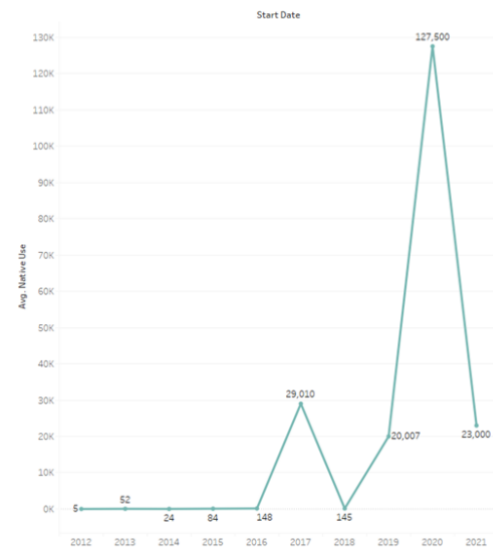
Southern Area Aquatics

Percentage of Total Cost by Commodity	Average Yearly Gas Usage
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Southern Tech and Rec

P er -	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Telecom Usage
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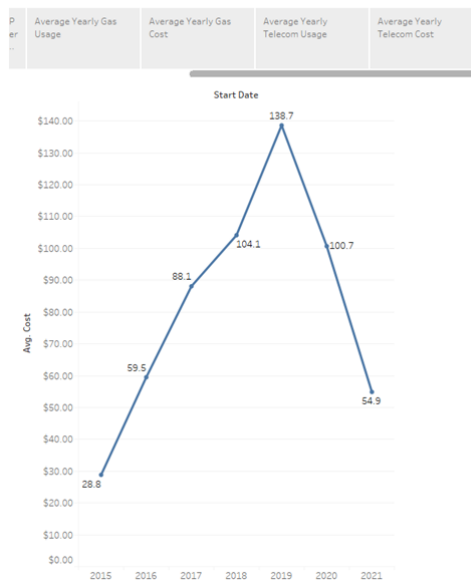


Average yearly water cost across facilities

Laurel



Palmer Park



Publick Playhouse



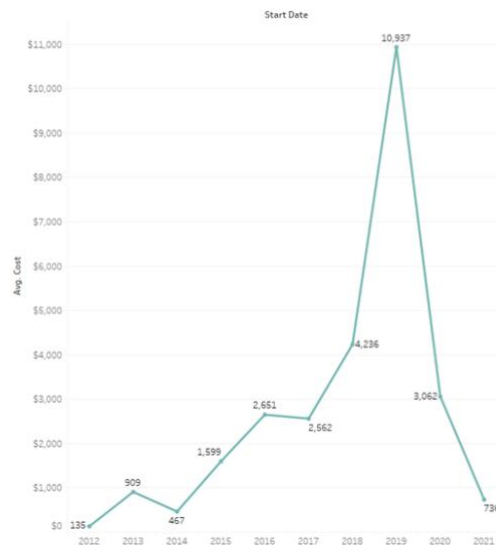
Southern Area Aquatics

Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage
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Southern Tech and Rec

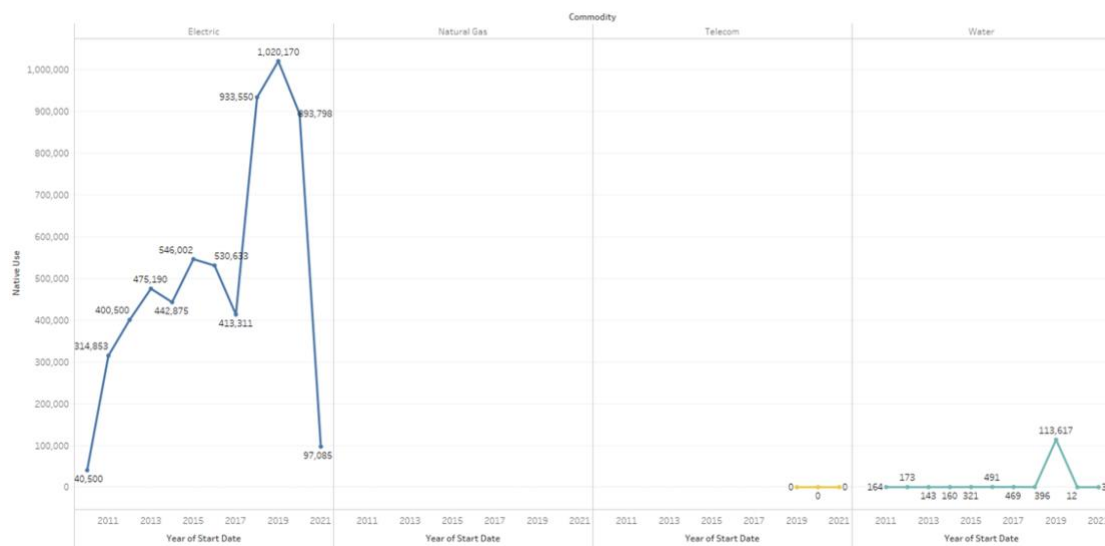
Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Telecom Usage
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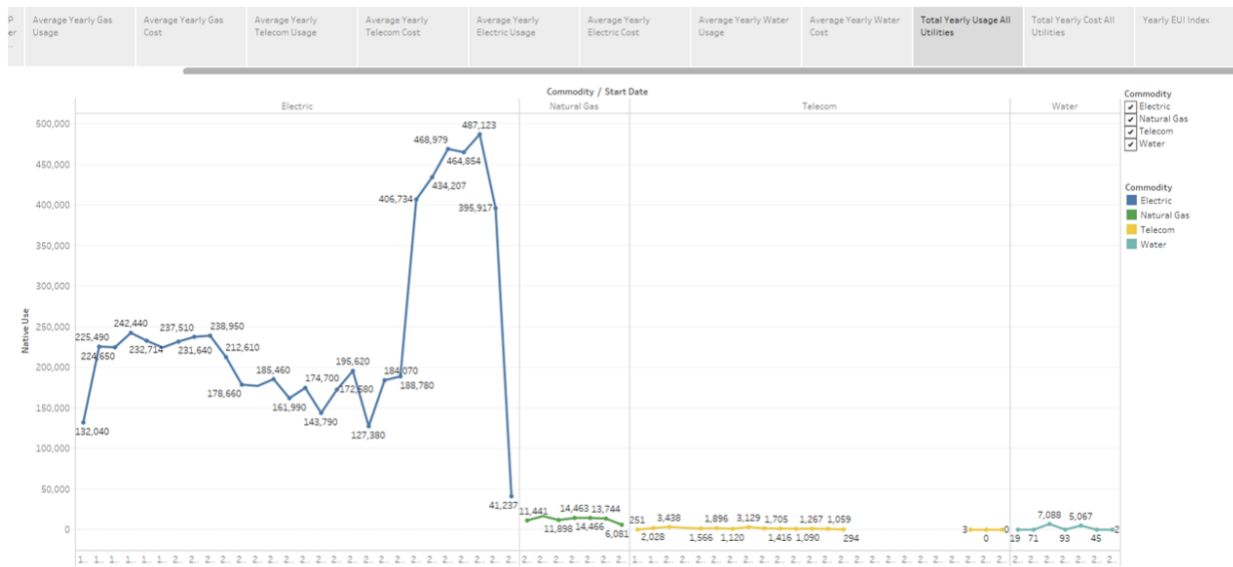
Total yearly usage by commodity for all facilities

Laurel

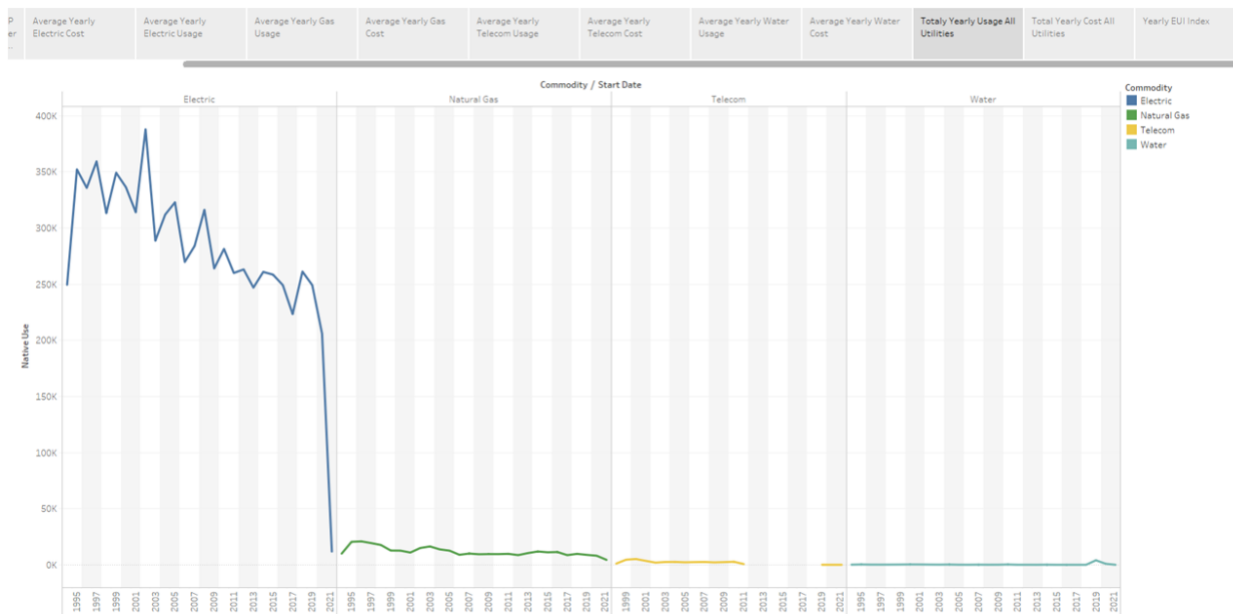
Pie Chart of Commodity Usage	Percentage Cost of All Utilities	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Average Yearly Gas Cost	Total Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
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Palmer Park

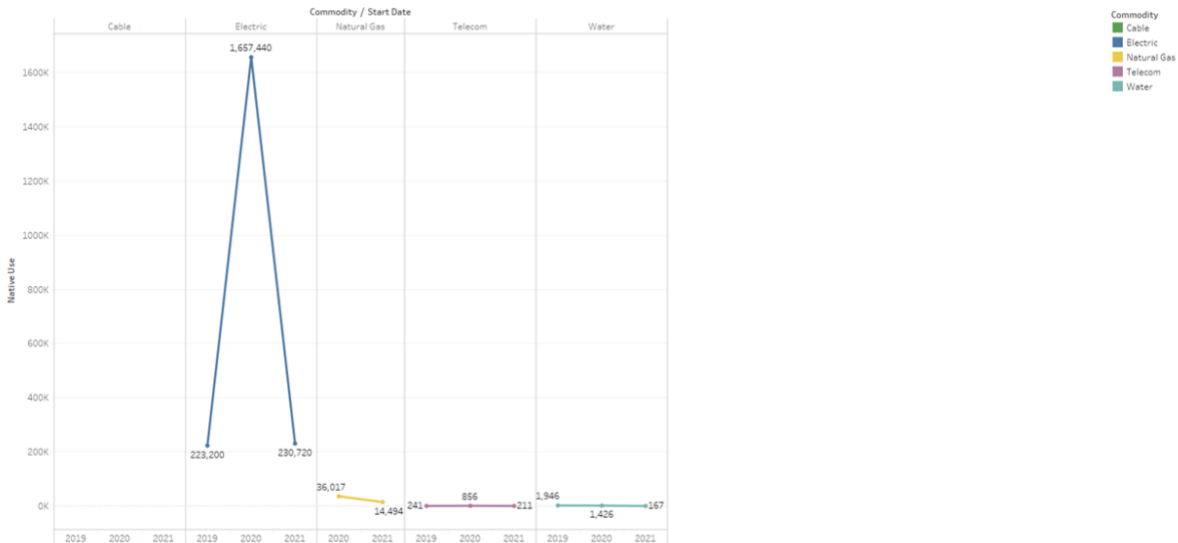


Public Playhouse



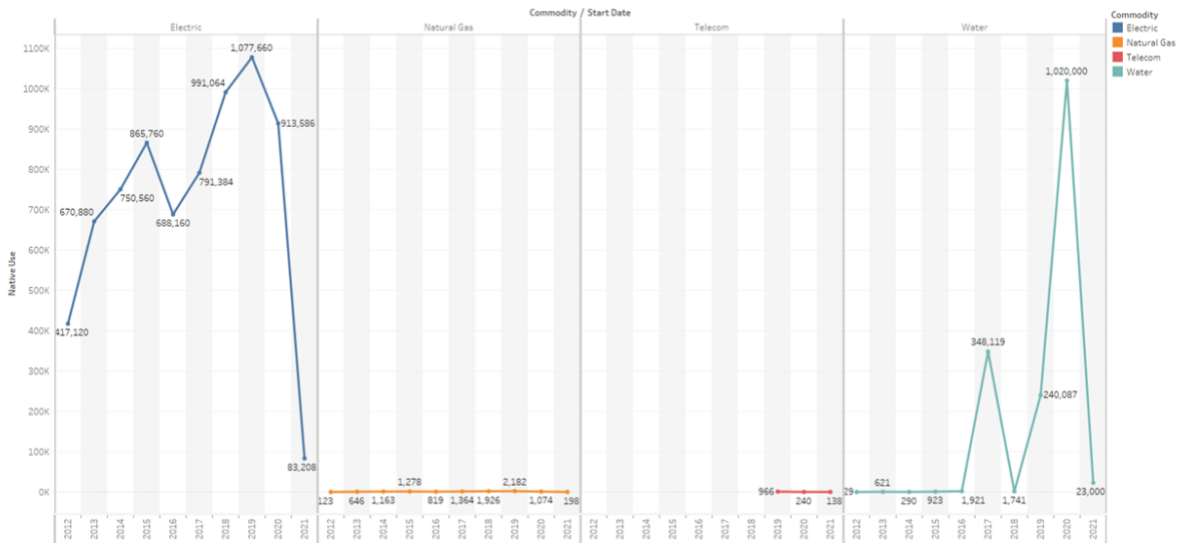
Southern Area Aquatics

Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Cable Cost	Total Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
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Southern Tech and Rec

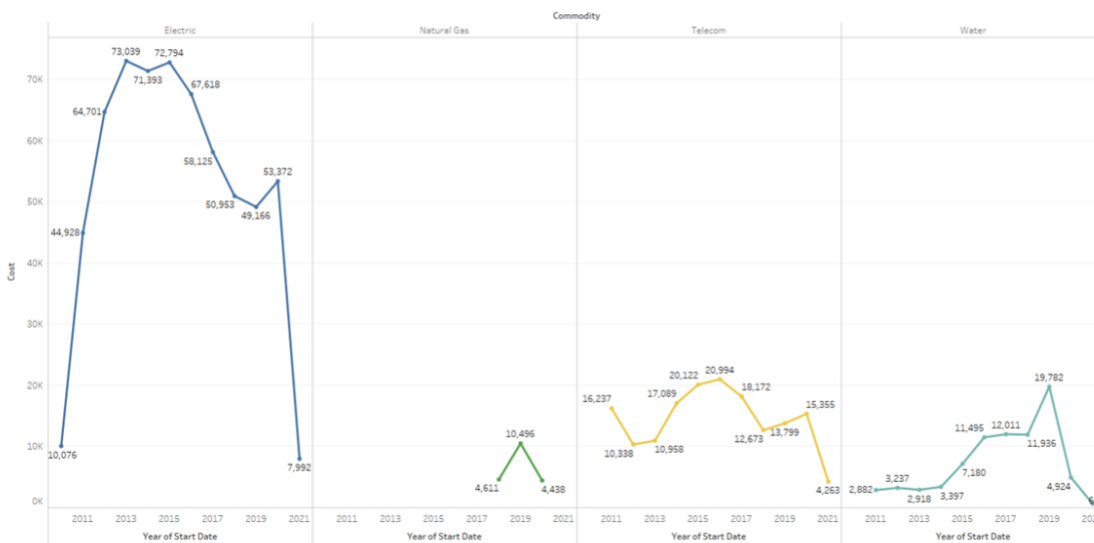
Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Cable Cost	Total Yearly Usage for All Utilities	Total Yearly Cost for All Utilities	Yearly EUI Index
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Total yearly cost for all utilities

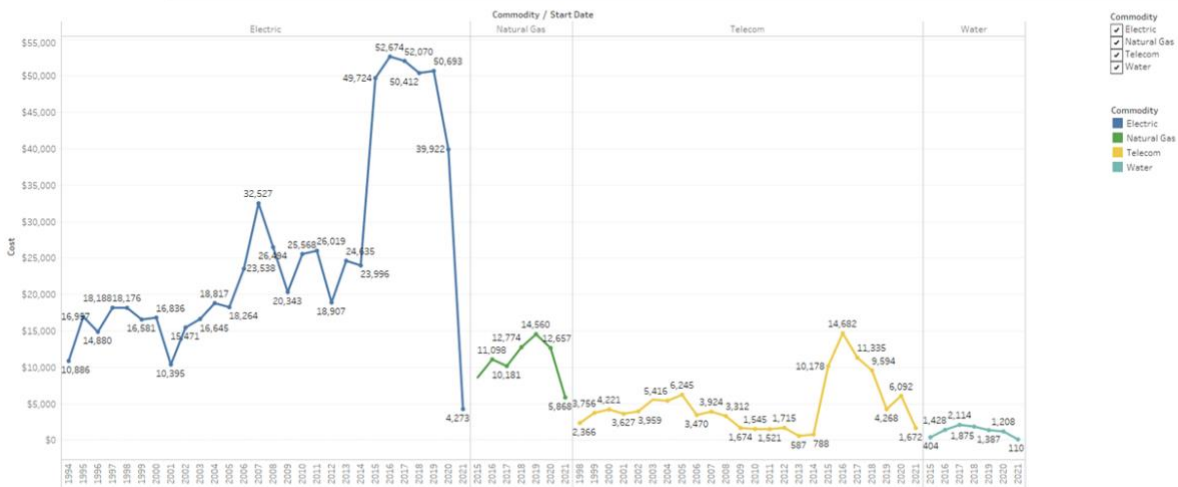
Laurel

Pie Chart of Commodity Usage	Percentage Cost of All Utilities	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Average Yearly Gas Cost	Total Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
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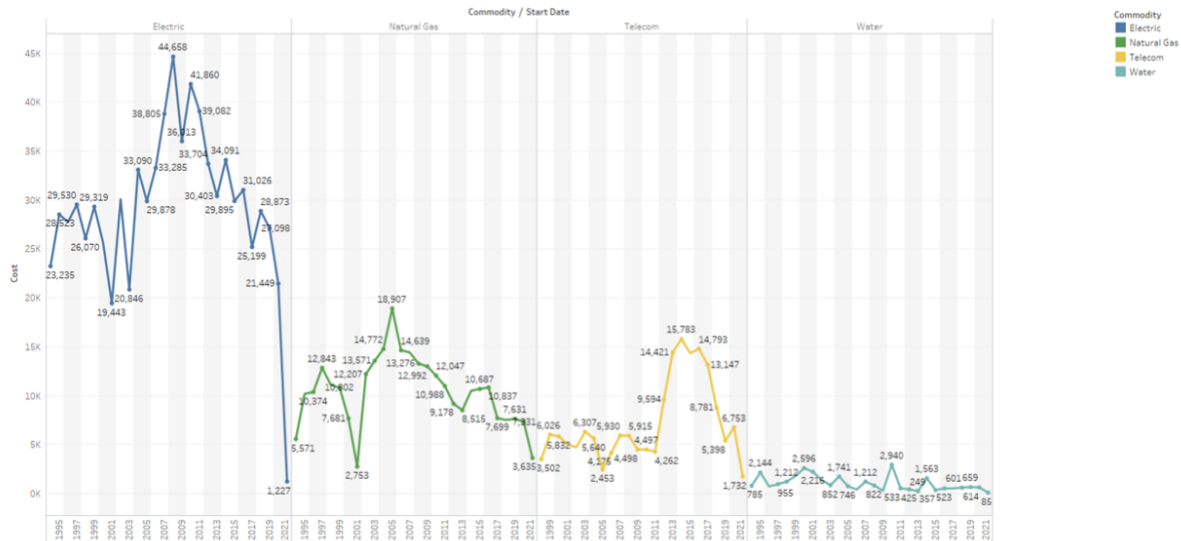
Palmer Park

Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Total Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
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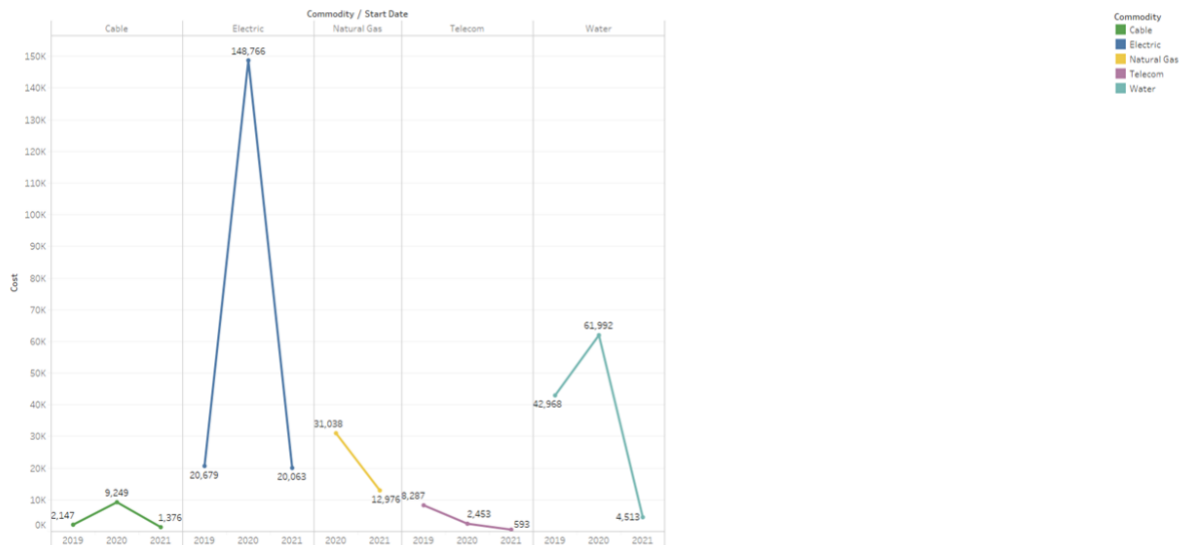
Publick Playhouse

P	Average Yearly Electric Cost	Average Yearly Electric Usage	Average Yearly Gas Usage	Average Yearly Gas Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Water Usage	Average Yearly Water Cost	Total Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
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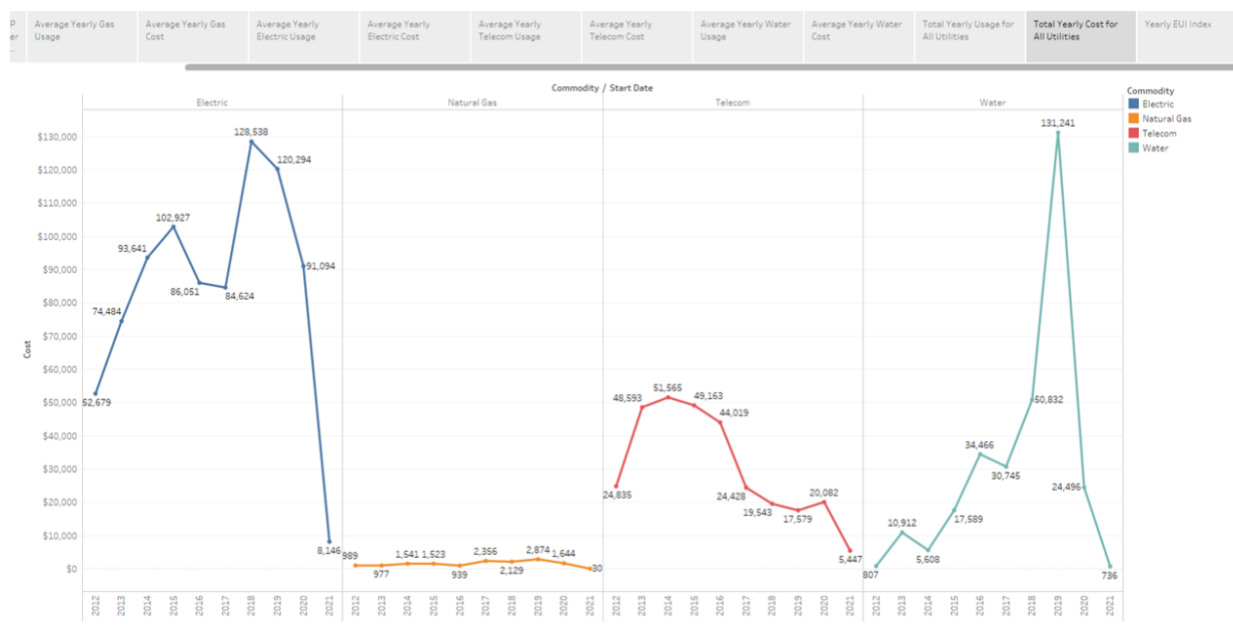


Southern Area Aquatics

A	Average Yearly Gas Cost	Average Yearly Electric Usage	Average Yearly Electric Cost	Average Yearly Water Usage	Average Yearly Water Cost	Average Yearly Telecom Usage	Average Yearly Telecom Cost	Average Yearly Cable Cost	Total Yearly Usage All Utilities	Total Yearly Cost All Utilities	Yearly EUI Index
v.											



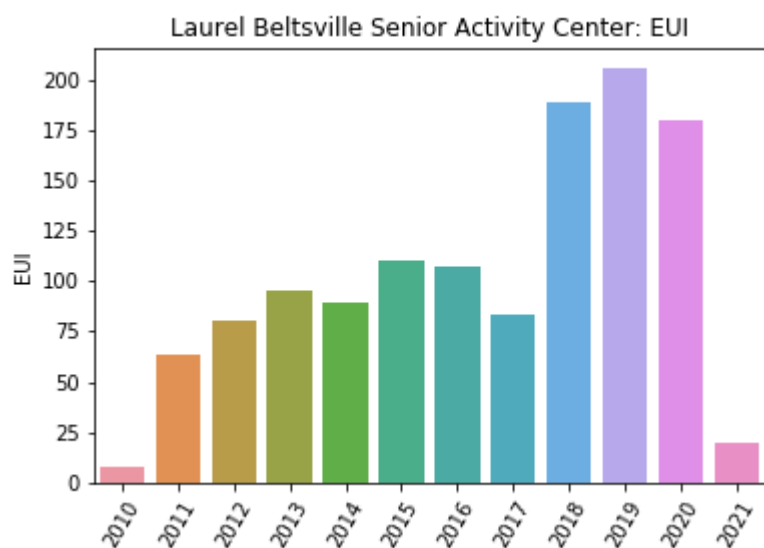
Southern Tech and Rec



To further the analysis, we measured the Energy Use Index by aggregating electric and natural gas use for each facility, converting it to kBtu and dividing by the gross building area. This tells us energy performance per square foot of building.

According to Energy Star, the annual Energy Use Index (EUI) for a recreational facility should be 112. The following graphs show EUI, written in Python, for each facility across the years.

Laurel-Beltsville (EUI)



Laurel Beltsville Senior Activity Center

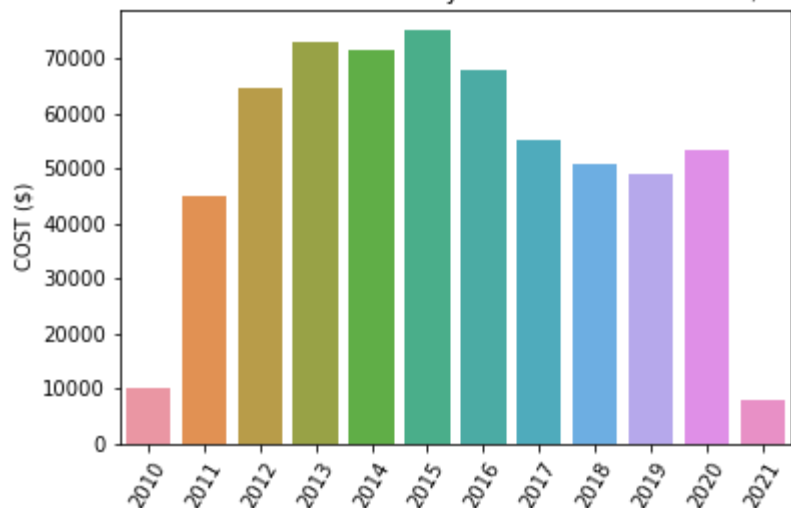
MISSING DATA in ELECTRIC:

	From	To	Days
0	2011-01-17	2011-01-20	3 days
1	2011-12-16	2012-01-19	34 days

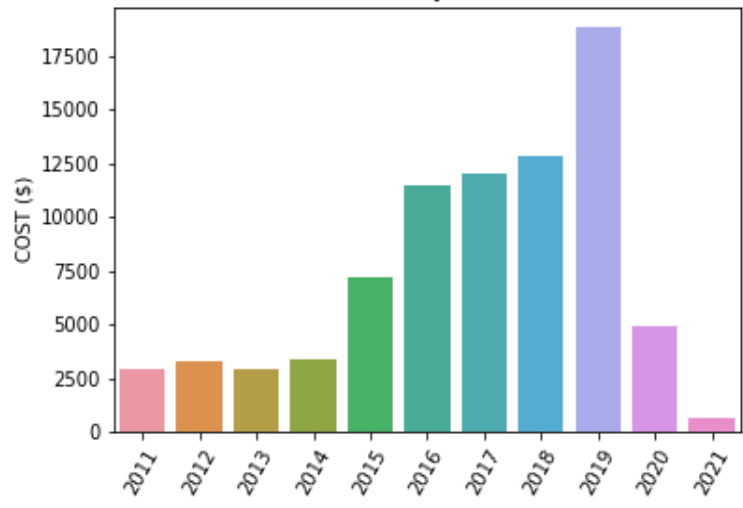
Start Date	EUI
2010	8.164609
2011	63.472877
2012	80.738907
2013	95.796058
2014	89.281507
2015	110.071422
2016	106.973105
2017	83.321544
2018	188.199267
2019	205.661450
2020	180.185452
2021	19.571877

Laurel-Beltsville (yearly utility cost)

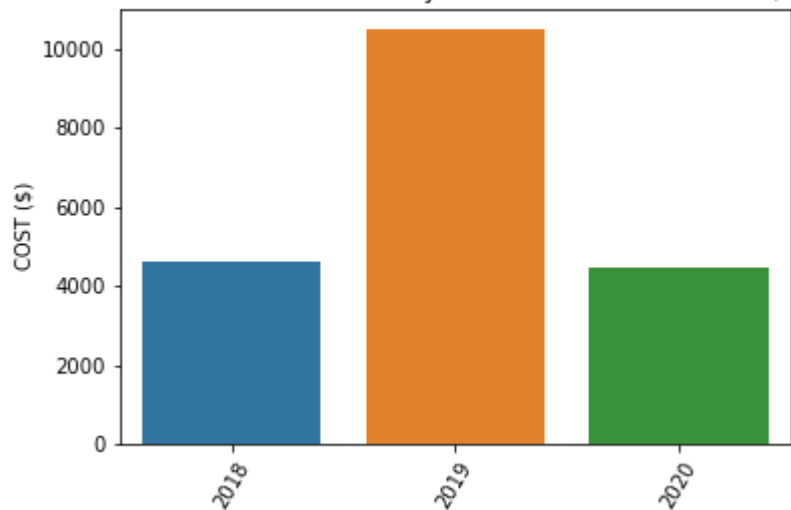
Laurel Beltsville Senior Activity Center: ELECTRIC COST/YEAR



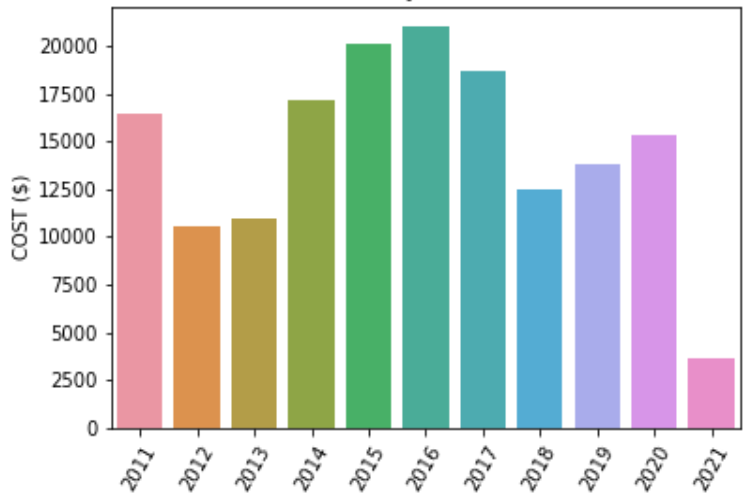
Laurel Beltsville Senior Activity Center: WATER COST/YEAR



Laurel Beltsville Senior Activity Center: NATURAL GAS COST/YEAR

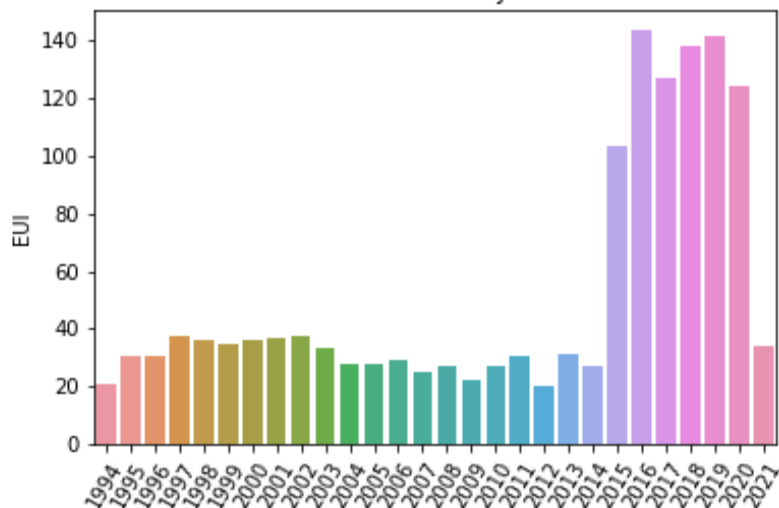


Laurel Beltsville Senior Activity Center: TELEPHONE COST/YEAR



Palmer Park (EUI)

Palmer Park Community Center: EUI



Palmer Park Community Center (EUI)

MISSING DATA in ELECTRIC:

	From	To	Days
0	1995-10-31	1996-01-31	92 days

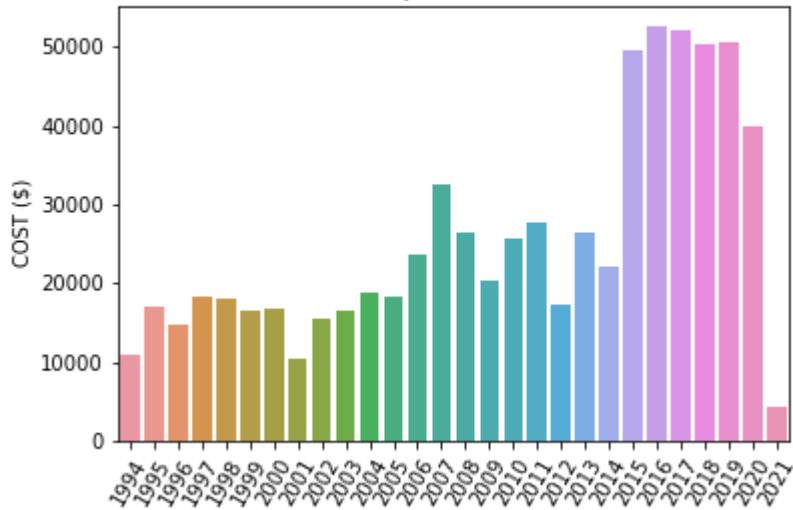
MISSING DATA in NATURALGAS:

	From	To	Days
0	2015-03-10	2015-07-08	120 days
1	2015-12-08	2016-01-08	31 days
2	2016-07-07	2016-09-06	61 days
3	2017-05-09	2017-11-09	184 days
4	2018-08-10	2018-10-12	63 days
5	2018-12-11	2019-01-10	30 days

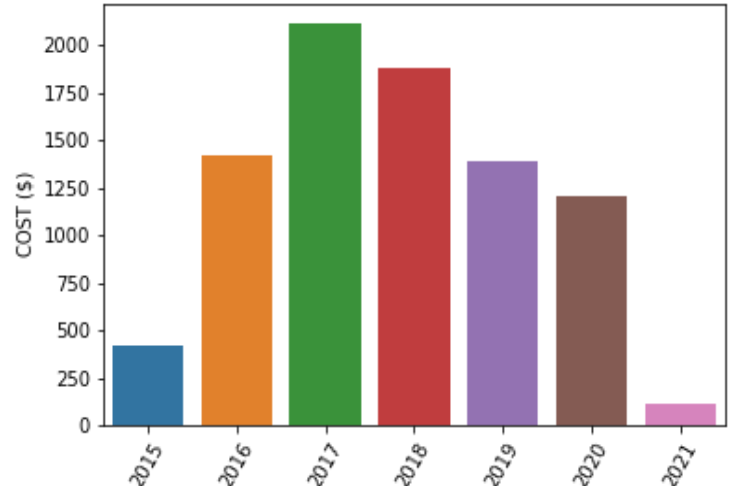
Start Date	EUI
1994	20.632942
1995	30.687921
1996	30.790650
1997	37.735746
1998	36.221895
1999	34.926266
2000	36.054727
2001	36.068202

Palmer Park (yearly utility cost)

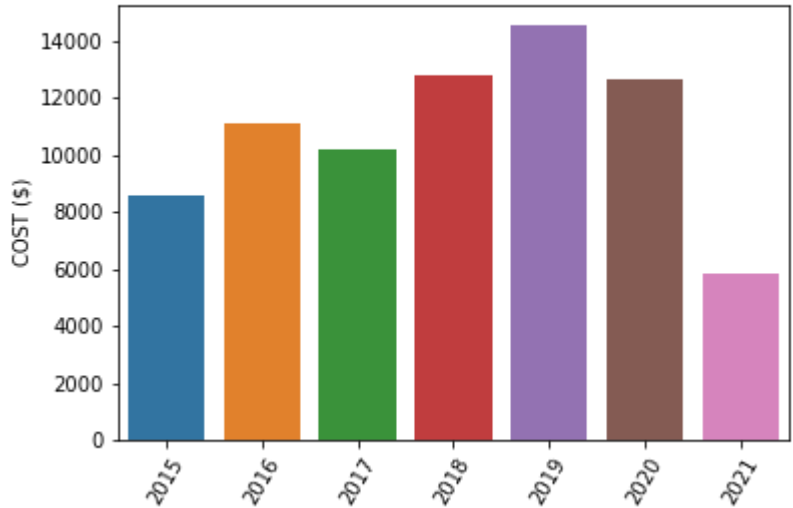
Palmer Park Community Center: ELECTRIC COST/YEAR



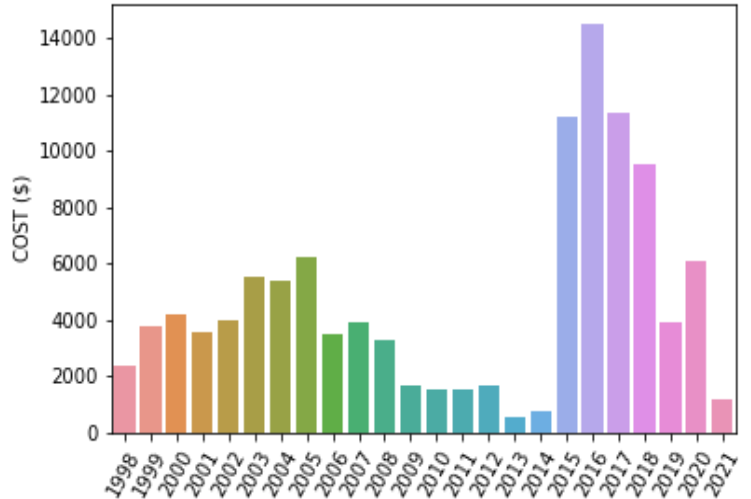
Palmer Park Community Center: WATER COST/YEAR



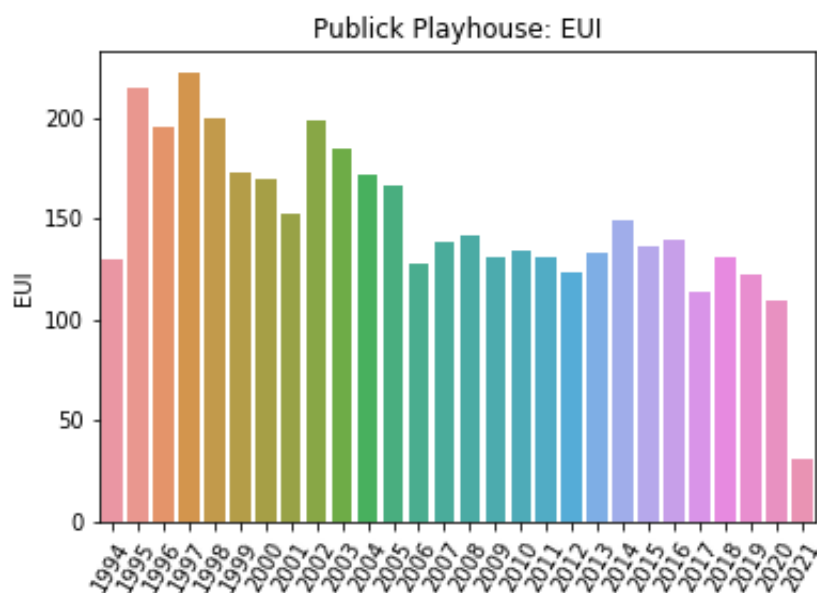
Palmer Park Community Center: NATURAL GAS COST/YEAR



Palmer Park Community Center: TELEPHONE COST/YEAR



Publick Playhouse (EUI)



Publick Playhouse (EUI)

MISSING DATA in ELECTRIC:

	From	To	Days
0	1995-11-13	1995-12-12	29 days
1	2017-10-17	2017-11-16	30 days

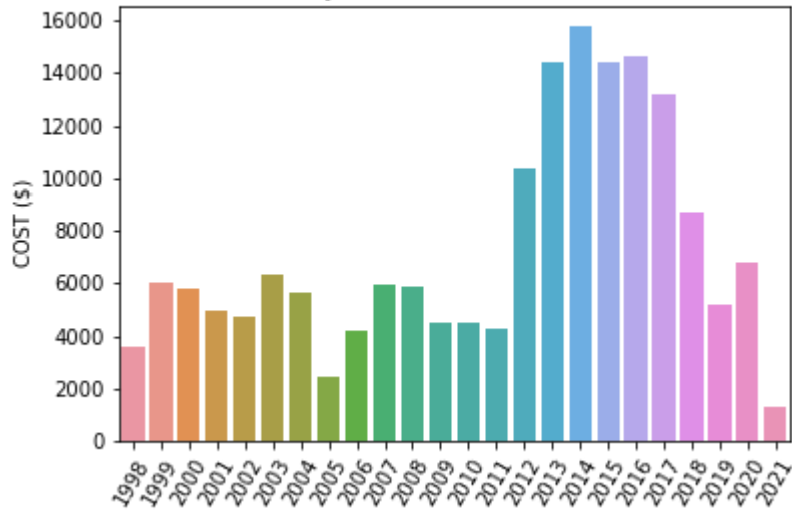
MISSING DATA in NATURALGAS:

	From	To	Days
0	1995-10-07	1995-11-06	30 days
1	1996-04-10	1996-11-06	210 days
2	1997-09-09	1997-10-08	29 days
3	2014-09-04	2014-10-03	29 days
4	2018-08-09	2018-10-10	62 days

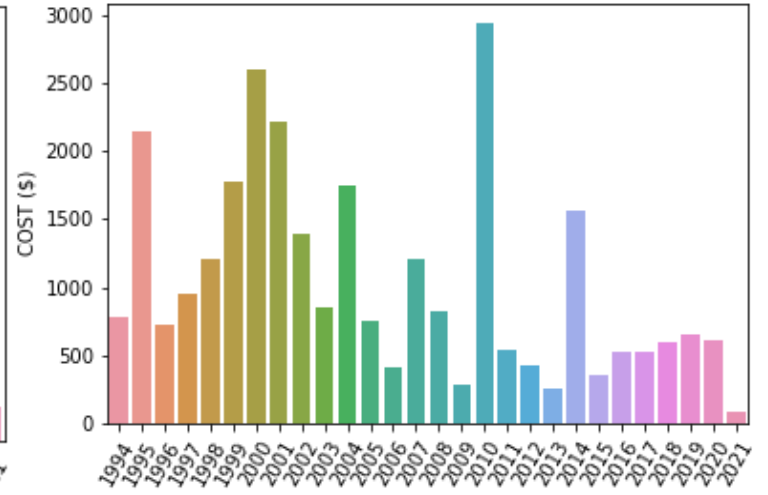
	EUI
Start Date	
1994	129.976136
1995	214.481440
1996	195.088168
1997	222.525308
1998	199.538499

Publick Playhouse (yearly utility cost)

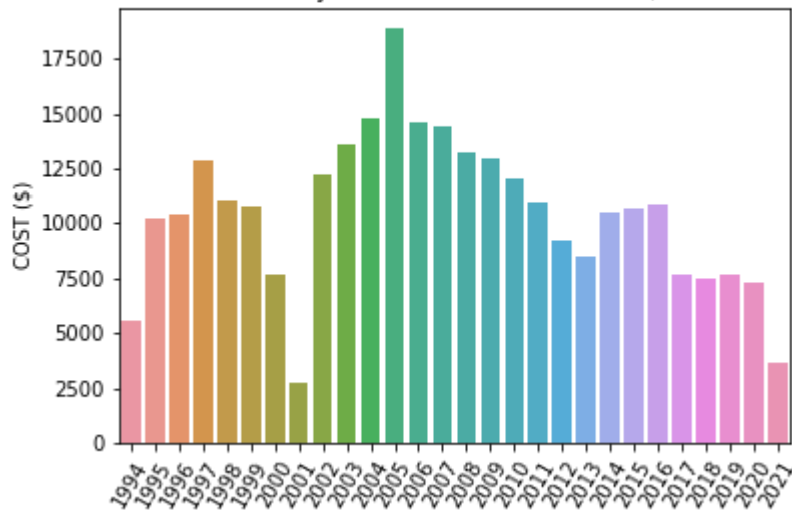
Publick Playhouse: TELEPHONE COST/YEAR



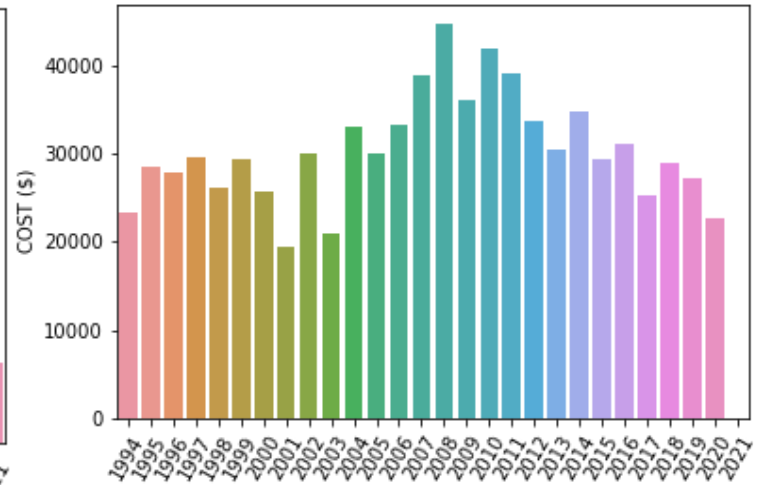
Publick Playhouse: WATER COST/YEAR



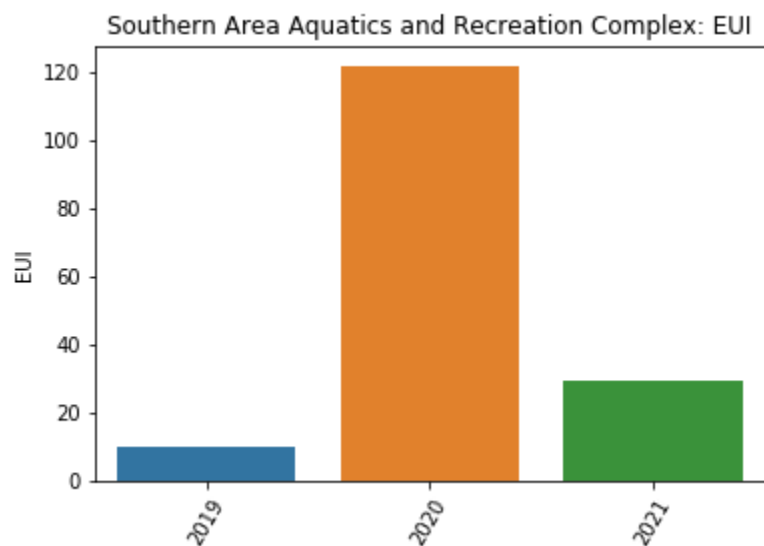
Publick Playhouse: NATURALGAS COST/YEAR



Publick Playhouse: ELECTRIC COST/YEAR



Southern Area Aquatics (EUI)

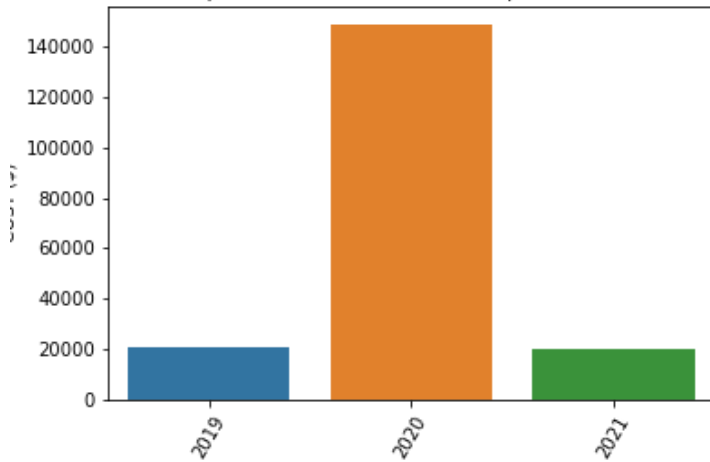


Southern Area Aquatics and Recreation Complex (EUI)

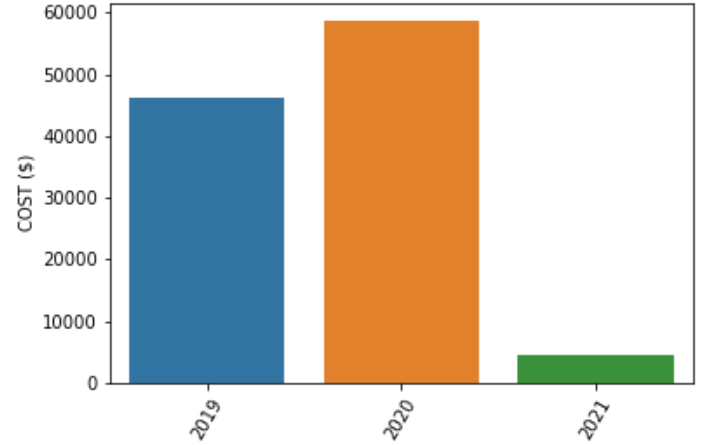
Start Date	EUI
2019	10.022615
2020	121.814785
2021	29.431199

Southern Area Aquatics (yearly utility cost)

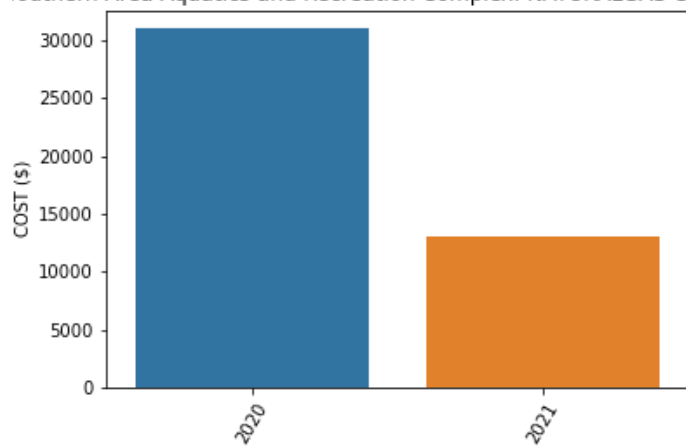
Southern Area Aquatics and Recreation Complex: ELECTRIC COST/YEAR



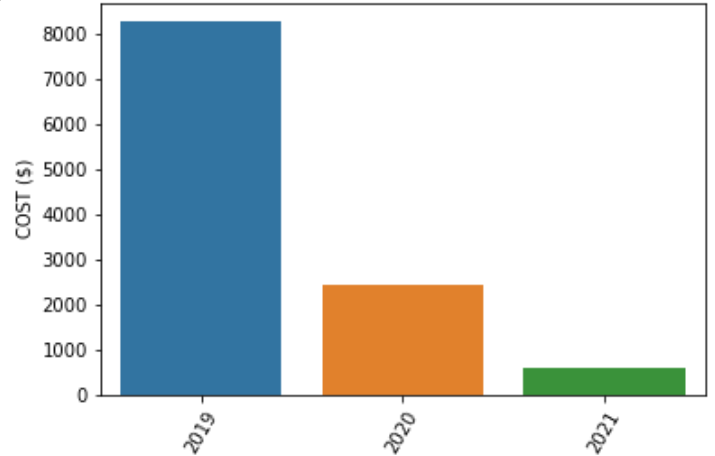
Southern Area Aquatics and Recreation Complex: WATER COST/YEAR



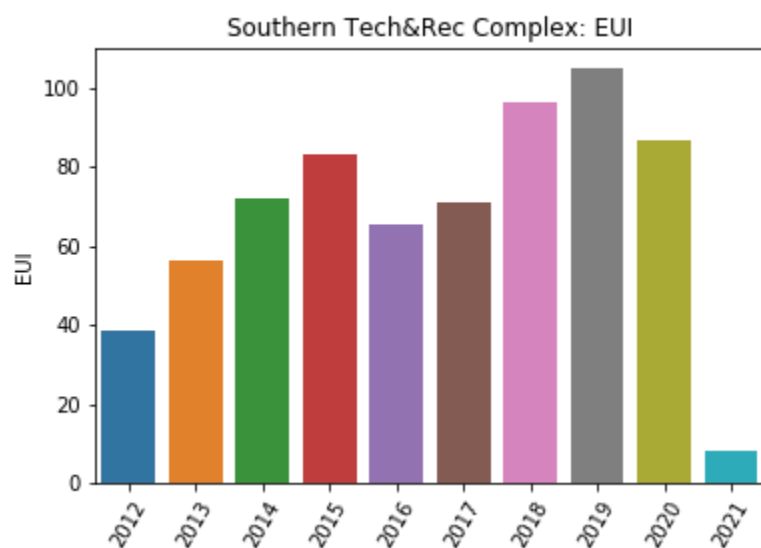
Southern Area Aquatics and Recreation Complex: NATURAL GAS COST/YEAR



Southern Area Aquatics and Recreation Complex: TELEPHONE COST/YEAR



Southern Tech and Rec Center (EUI)



Southern Tech&Rec Complex (EUI)

MISSING DATA in ELECTRIC:

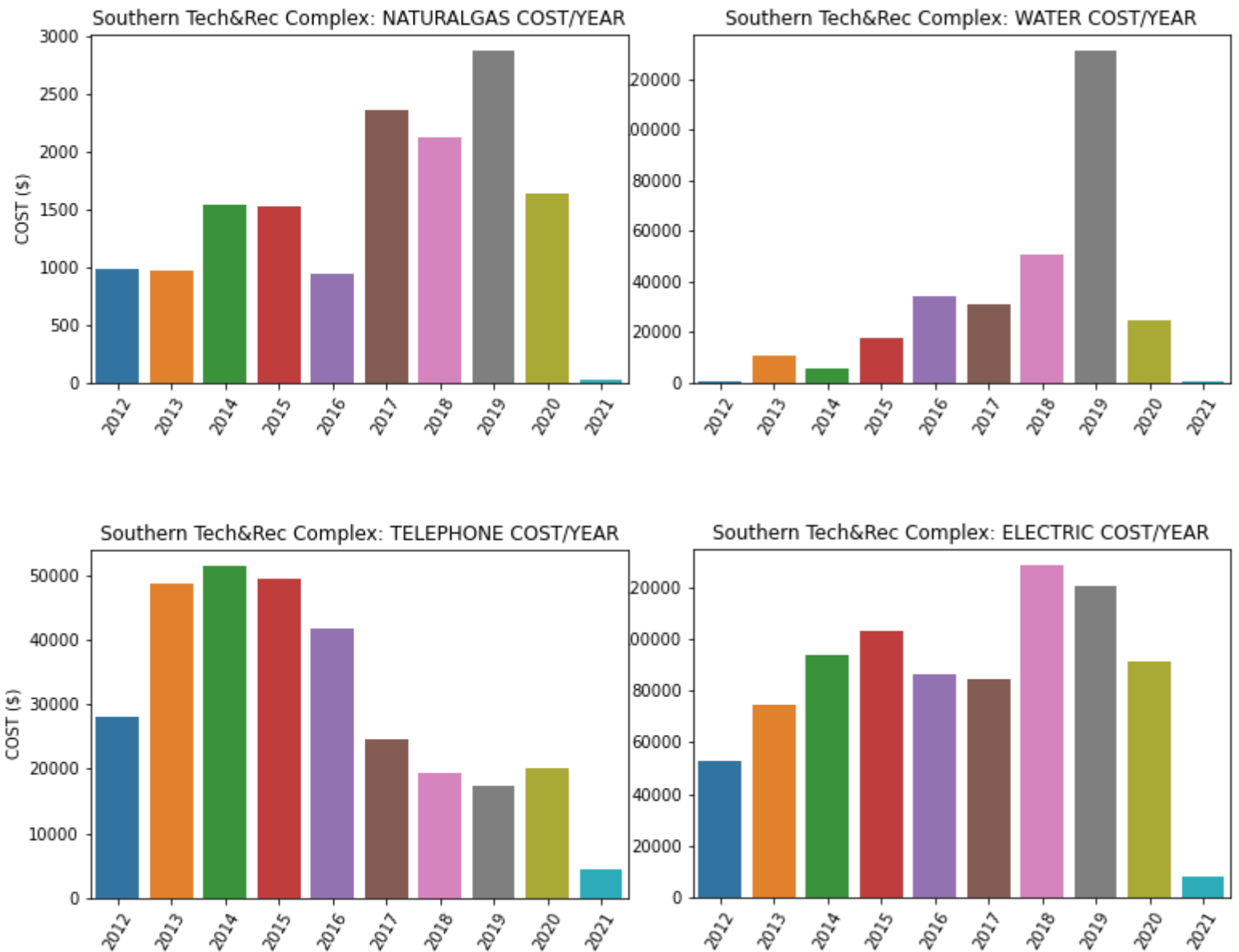
	From	To	Days
0	2013-08-21	2013-09-23	33 days
1	2017-08-25	2017-09-28	34 days

MISSING DATA in NATURALGAS:

	From	To	Days
0	2016-06-15	2017-01-24	223 days
1	2016-12-13	2017-11-17	339 days

Start Date	EUI
2012	38.746775
2013	56.278733
2014	72.262819
2015	83.181888
2016	65.586870
2017	71.082309

Southern Tech and Rec Center (yearly utility cost)



Analysis

The visualizations created using Tableau and Python provide the trends for commodity consumption at the Prince George's County facilities. For various levels of detail, bar graphs, line graphs and pie charts were developed to better conceptualize the usage and costs of electricity, water, natural gas, telecommunications, and cable.

Percentage Usage Data

The usage and cost data shows the non-unique attribute of each facility's dependency on electricity. The electricity usage across nearly all the facilities ranges from 95% to 98% of all commodity usage. The Southern Regional Technology and Recreation Complex is an outlier; its electrical usage is a more modest 81.47% of total commodity usage. It's important to note that the most of the complex's total commodity usage, 18.39%, is water usage.

The only facility where natural gas usage sees significant comparative usage is the Publick Playhouse, where 4.04% of commodity usage is gas. A likely factor is the facility's age; it was constructed in 1947.

Percentage Cost Data

More interestingly, the cost of the commodities is not equal, which differentiates each facility more than the usage statistics. All the facilities follow a similar cost structure, with electricity accounting for the majority of cost, but the differentiating factors of each facility create a range of percentages for each attribute.

Telecommunication plays a much more significant role for cost structure, ranging from roughly 3% of cost at Southern Area Aquatics and Recreation Complex to nearly 21% at the Southern Regional Technology and Recreation Complex. Despite the differences in their telecommunication costs, the two facilities have a much larger water cost footprint, likely due to the nature of the complexes.

Cable is only factored into the newest facility, Southern Area Aquatics and Recreation Complex, although accounts for less than 4% of the overall cost.

Natural gas is the most telling commodity. There is still a need for this resource in newer facilities, and the underlying cost is still present. Publick Playhouse is as an example of newer systems being less natural gas reliant; nearly a quarter of the building's commodity costs come from natural gas.

Electricity Usage Data

Due to the large overall footprint of electricity usage and cost for the facilities, we developed year-by-year visualizations. Assessing average yearly electric usage shows unique differences in the trends for each facility. To include only full-year readings, 2021 was not factored in and there are extreme changes in some timelines, which may be due to volatile construction periods.

The Laurel-Beltsville Senior Center has seen considerable volatility after its completion in 2012 but is on an overall upward trend. Palmer Park Community Center's usage has been on a downward trend since 1994 but saw a massive several-year, all-time high for years surrounding the renovations completed in 2016. The Publick Playhouse has seen electricity usage plummet since 1994; 2020 usage was roughly a third of 1994 usage. Southern Region Technology and Recreation Center is the opposite, with 48% higher usage in 2020 than when its doors opened in 2013. Lastly, Southern Area Aquatics and Recreation Complex is showing a moderate upward trend, although its recent grand opening means there is a small amount of data for times of standard operation.

Electricity Cost Data

The usage of a commodity does not necessarily mean a one-to-one correlation to cost. For example, the Laurel-Beltsville Senior Center's electricity cost directly contradicts the heightened usage, hosting a downward cost trend. Publick Playhouse sees a similar starting and end point, but heavily deviates and sharply heightens for the ten years between 2004 and 2014. Southern Area Aquatics and Recreation Complex, Palmer Park Community Center, and Southern Regional Technology and Recreation Complex are much more coherent to their counterparts of usage, correlating neatly.

Gas Usage and Cost Data

As mentioned, the newer facilities and the Publick Playhouse rely less on natural gas. The Laurel-Beltsville Senior Center dataset didn't include any gas usage, although the cost roughly doubled from 2018 to 2020. Palmer Park Community Center shows a neatly correlated slow decline in usage and cost from 2015 to 2020. There's a similar correlation between the usage and cost data for the Publick Playhouse and the Southern Region Technology and Recreation Center. It's important to note that the 2021 data provides a sharp increase for each facility, with an exception for Southern Region Technology and Recreation Center. The Southern Area Aquatics and Recreation Complex only shows data from 2020 and 2021 and may require a lengthier data collection time to accurately compare pricing and usage.

Telecom Usage and Cost Data

Telecommunications is a sizable portion of commodity cost for the majority of facilities, even with comparatively less usage. Laurel's telecom usage data is not available, although the cost data is, which shows a downward trend. The Southern Area Aquatics and Recreation Complex only has three years of data that contradict one another; usage is spiking upward and cost spiking downward. Construction costs may be a factor as the expense of telecommunication installation is not detailed. Publick Playhouse has a weak correlation, with a usage spike in 2000 and much less significant expense.

Southern Region Technology and Recreation Center's cost has seen a considerable decline over nearly a decade but shows little usage data until 2019. Palmer Park shows the least consistency out of all the buildings with very volatile usage year-by-year.

Water Usage and Cost Data

Each of the facilities have some form of utility and cost data for water, although the Laurel-Beltsville Senior Center seems to be missing a large portion of pre-2019 usage data. When compared to the usage data, there are few other explanations to source its volatile cost metrics. Palmer Park Community Center seems to have a similar issue, with usage data only for 2017 and 2019, and more realistic cost data. The same can be seen with Publick Playhouse and Southern Region Technology and Recreation Center which has many near-zero years for water usage where data is not available despite cost data showing a more realistic measurement year-by-year. The outlier was Southern Area Aquatics and Recreation Complex, given its recent introduction in 2020, where the average usage and costs are neatly correlated each year.

Recommendations

Further data could make future analyses even more insightful.

Data Collection Suggestions:

- Thermostat Data
 - How much money goes toward heating and cooling?
 - Is the building too hot or cold?
 - Are there inefficiencies in the system?
- Building Traffic
 - How many people enter and exit in a day?
 - What is the cost per person to operate?
 - Conduct surveys on building climate (too hot, too cold)
 - How long do people stay in the building?
- Mapping out which meters control which utilities
 - How much do lights cost?
 - How much does AC cost?
 - How much does heat cost?
- Initial building cost
- Cost of required updates
- Cost of maintenance
- Is building over- or under-staffed?